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EXAMINER

THANGAVELU, KANDASAMY

ART UNIT	PAPER NUMBER
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2123

DATE MAILED: 12/08/2003

4

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application No.

09/638,268

Applicant(s)

BRYAN ET AL.

Examiner

Kandasamy Thangavelu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 August 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 11-16 is/are rejected.
- 7) ☒ Claim(s) 9 and 10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 August 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Introduction

1. Claims 1-16 of the application have been examined.

Drawings

2. The drawings are objected to; see a copy of Form PTO-948 for an explanation.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 4 and 13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 4 recites " The method of claim 4". A claim cannot be based on itself; it could be based only on a previously recited claim.

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Claim 13 recites " The computer-usable medium of claim 11 ". There is insufficient antecedent basis for this limitation in the claim. Claim 11 refers to "The method of claim 8" and not "The computer-usable medium".

Claim Interpretations

5. For the purpose of art rejections, the rejected claims have been interpreted as follows:

In Claim 4, "The method of claim 4" is interpreted as "The method of claim 1".

In Claim 13, "The computer-usable medium of claim 11" is interpreted as "The computer-usable medium of claim 12".

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.

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3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 1, 3, 4, 12 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hellestrand et al. (HE)** (U.S. Patent 6,263, 302) in view of **Geer et al. (GE)** (U.S. Patent 6,212,667).

8.1 **HE** teaches hardware and software co-simulation including simulating the cache of a target processor. Specifically as per Claim 1, **HE** teaches providing a design-under-test (DUT) configuration file comprising a specification of bus transactions corresponding to the DUT (CL10, L24-33). **HE** does not expressly teach providing a design-under-test (DUT) configuration file comprising a specification of bus transaction types and parameters corresponding to the DUT. **GE** teaches providing a design-under-test (DUT) test definition file comprising a specification of types and parameters corresponding to the DUT (Fig. 3, Item 123; CL5, L23-33; CL6, L65 to CL7, L6), as that allows generating a relatively large number of random test cases that are more likely to test specific behavior specified by the parameters in the configuration file (CL5, L23-33). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the method of **HE** comprising specification of bus transactions with the method of **GE** that included specification of types and parameters corresponding to the DUT, as that would allow generating a relatively large number of random test cases that would be more likely to test specific behavior of the bus transactions specified by the parameters in the configuration file.

HE teaches simulating the bus transactions using the descriptions of the bus hardware model (CL10, L24-33). **HE** does not expressly teach processing the configuration file to generate a test case comprising bus transactions for verification of the DUT. **GE** teaches processing the configuration file to generate a test case for verification of the DUT (Fig. 3; CL5, L23-33; CL6, L65 to CL7, L36), as that allows generating a relatively large number of random test cases that are more likely to test specific behavior specified by the parameters in the configuration file (CL5, L23-33). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the method of **HE** comprising simulating bus transactions with the method of **GE** that included processing the configuration file to generate a test case for verification of the DUT, as that would allow generating a relatively large number of random test cases comprising bus transactions that would be more likely to test specific behavior of the bus transactions specified by the parameters in the configuration file.

8.2 As per Claim 3, **HE** and **GE** teach the method of claim 1. **HE** does not expressly teach that the processing step comprises converting the specification into a plurality of combinations of the parameters. **GE** teaches that the processing step comprises converting the specification into a plurality of combinations of the parameters (CL5, L23-33; CL6, L65 to CL7, L6), as that allows generating a relatively large number of random test cases that are more likely to test specific behavior specified by the parameters in the configuration file (CL5, L23-33). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **HE** with the method of **GE** that included the processing step comprising converting the specification into a plurality of combinations of the parameters, as that would

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allow generating a relatively large number of random test cases that would be more likely to test specific behavior of the bus transactions specified by the parameters in the configuration file.

8.3 As per Claim 4, **HE** and **GE** teach the method of claim 1. **HE** also teaches applying the bus transactions to the DUT for verification (CL10, L24-33).

8.4 As per Claim 12, **HE** teaches a computer-usable medium storing computer-executable instructions, the instructions when executed implementing a process (Fig. 1; CL9, L23-27; CL10, L24-33);

evaluating a syntax of a DUT configuration file including statements corresponding to the DUT (CL10, L24-33); and

generating bus functional language statements from the syntax (CL10, L24-33).

HE does not expressly teach a DUT configuration file including statements defining transaction types and parameters corresponding to the DUT. **GE** teaches a DUT configuration file including statements defining transaction types and parameters corresponding to the DUT (Fig. 3, Item 123; CL5, L23-33; CL6, L65 to CL7, L6), as that allows generating a relatively large number of random test cases that are more likely to test specific behavior specified by the parameters in the configuration file (CL5, L23-33). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the computer-usable medium storing computer-executable instructions of **HE** comprising evaluating a syntax of a DUT configuration file with the computer-usable medium storing computer-executable instructions of **GE** that included DUT configuration file including statements defining

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transaction types and parameters corresponding to the DUT, as that would allow generating a relatively large number of random test cases that would be more likely to test specific behavior of the bus transactions specified by the parameters in the configuration file.

8.5 As per Claim 15, **HE** teaches a system comprising a memory including computer-executable instructions and a processor coupled to the memory for executing the instructions (Fig. 1; CL9, L23-27; CL10, L24-33);

a configuration file for a DUT (CL10, L24-33); wherein

the instructions process the configuration file to generate bus transactions for verification of the DUT (CL10, L24-33).

HE does not expressly teach configuration file for a DUT including bus transaction types and parameters corresponding to the DUT. **GE** teaches configuration file for a DUT including bus transaction types and parameters corresponding to the DUT (Fig. 3, Item 123; CL5, L23-33; CL6, L65 to CL7, L6), as that allows generating a relatively large number of random test cases that are more likely to test specific behavior specified by the parameters in the configuration file (CL5, L23-33). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **HE** with the system of **GE** that included configuration file for a DUT including bus transaction types and parameters corresponding to the DUT, as that would allow generating a relatively large number of random test cases that would be more likely to test specific behavior of the bus transactions specified by the parameters in the configuration file.

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9. Claims 2, 13, 14 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hellestrand et al. (HE)** (U.S. Patent 6,263, 302) in view of **Geer et al. (GE)** (U.S. Patent 6,212,667), and further in view of **Huggins (HU)** (U.S. Patent 5,956,478).

9.1 As per Claim 2, **HE** and **GE** teach the method of claim 1. **HE** does not expressly teach that the processing step further comprises evaluating rules in the configuration file to include or exclude selected ones of the bus transactions from the test case. **HU** teaches that the processing step further comprises evaluating rules in the configuration file to include or exclude selected ones of the bus transactions from the test case (CL2, L35-39), as that allows generating the test cases in reduced time and produces tests which exercise the device in a manner which is close to actual operation, to increase their effectiveness in testing (CL2, L41-45). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **HE** with the method of **HU** that included the processing step further comprising evaluating rules in the configuration file to include or exclude selected ones of the bus transactions from the test case, as that would allow generating the test cases in reduced time and would produce tests which exercised the device in a manner which was close to actual operation, to increase their effectiveness in testing.

9.2 As per Claim 13, **HE** and **GE** teach the computer-usable medium of claim 12. **HE** does not expressly teach that the configuration file further includes rules for including or excluding selected bus functional language statements from being generated. **HU** teaches that the configuration file further includes rules for including or excluding selected bus functional

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language statements from being generated (CL2, L35-39), as that allows generating the test cases in reduced time and produces tests which exercise the device in a manner which is close to actual operation, to increase their effectiveness in testing (CL2, L41-45). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer-usable medium of **HE** with the computer-usable medium of **HU** that included the configuration file further including rules for including or excluding selected bus functional language statements from being generated, as that would allow generating the test cases in reduced time and would produce tests which exercised the device in a manner which was close to actual operation, to increase their effectiveness in testing.

9.3 As per Claim 14, **HE** and **GE** teach the computer-usable medium of claim 12. **HE** does not expressly teach that the evaluating and generating steps comprise testing a parameter combination generated from the configuration file against the rules. **HU** teaches that the evaluating and generating steps comprise testing a parameter combination generated from the configuration file against the rules (CL2, L35-39), as that allows generating the test cases in reduced time and produces tests which exercise the device in a manner which is close to actual operation, to increase their effectiveness in testing (CL2, L41-45). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer-usable medium of **HE** with the computer-usable medium of **HU** that included the evaluating and generating steps comprising testing a parameter combination generated from the configuration file against the rules, as that would allow generating the test cases in reduced time

and would produce tests which exercised the device in a manner which was close to actual operation, to increase their effectiveness in testing.

HE teaches outputting the parameter combination in a bus functional language statement (CL10, L24-32). **HE** does not expressly teach outputting the parameter combination in a bus functional language statement when the parameter combination is not excluded by the rules. **HU** teaches outputting the parameter combination in a bus functional language statement when the parameter combination is not excluded by the rules (CL2, L35-39), as that allows producing tests which exercise the device in a manner which is close to actual operation, to increase their effectiveness in testing (CL2, L41-45). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the computer-usable medium of **HE** with the computer-usable medium of **HU** that included outputting the parameter combination in a bus functional language statement when the parameter combination is not excluded by the rules, as that would allow producing tests which exercised the device in a manner which was close to actual operation, to increase their effectiveness in testing.

9.4 As per Claim 16, **HE** and **GE** teach the system of claim 15. **HE** does not expressly teach that the configuration file includes rules for including or excluding selected bus transactions from being generated. **HU** teaches that the configuration file includes rules for including or excluding selected bus transactions from being generated (CL2, L35-39), as that allows generating the test cases in reduced time and produces tests which exercise the device in a manner which is close to actual operation, to increase their effectiveness in testing (CL2, L41-45). It would have been obvious to one of ordinary skill in the art at the time of Applicants'

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invention to modify the system of **HE** with the system of **HU** that included the configuration file including rules for including or excluding selected bus transactions from being generated, as that would allow generating the test cases in reduced time and would produce tests which exercised the device in a manner which was close to actual operation, to increase their effectiveness in testing.

10. Claims 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hellestrand et al. (HE)** (U.S. Patent 6,263, 302) in view of **Geer et al. (GE)** (U.S. Patent 6,212,667), and further in view of **El-Ghoroury et al. (EL)** (U.S. Patent 5,867,400).

10.1 As per Claim 5, **HE** teaches simulating the bus transactions using the descriptions of the bus hardware model for verification of the DUT (CL10, L24-33).

HE does not expressly teach describing a DUT in a configuration file using a condensed syntax. **EL** teaches describing a DUT in a configuration file using a condensed syntax (CL3, L65 to CL4, L10), as that allows the test engineer to convert the test case definition file directly to test cases without in-depth knowledge of the algorithms associated with each test case syntax; using this condensed syntax, the test cases may be designed with a simple program that specifies the relationship between different syntax, the parameters of each test case and the test cases (CL3, L66 to CL4, L6). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the method of **HE** with the method of **EL** that included describing a DUT in a configuration file using a condensed syntax, as that would allow the test engineer to convert the test case definition file directly to test cases without in-depth knowledge

of the algorithms associated with each test case syntax; using this condensed syntax, the test cases might be designed with a simple program that specified the relationship between different syntax, the parameters of each test case and the test cases.

HE does not expressly teach generating a test case for verification of the DUT by converting the condensed syntax into an enumeration of possible parameter combinations for bus transactions of the DUT. **GE** teaches generating a test case for verification of the DUT by converting the test case definition file into an enumeration of possible parameter combinations for the DUT (Fig. 3; CL5, L23-33; CL6, L65 to CL7, L36), as that allows generating a relatively large number of random test cases that are more likely to test specific behavior specified by the parameters in the configuration file (CL5, L23-33). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the method of **HE** comprising simulating bus transactions using the descriptions of the bus hardware model for verification of the DUT with the method of **GE** that included generating a test case for verification of the DUT by converting the test case definition file into an enumeration of possible parameter combinations for the DUT, as that would allow generating a relatively large number of random test cases comprising bus transactions that would be more likely to test specific behavior of the bus transactions specified by the parameters in the configuration file.

HE does not expressly teach generating a test case for verification of the DUT by converting the condensed syntax into an enumeration of possible parameter combinations for bus transactions of the DUT. **EL** teaches generating a definition of the DUT by converting the condensed syntax into an enumeration of possible parameter combinations for the DUT (CL3, L65 to CL4, L10), as that allows the test engineer to convert the test case definition file directly

to test cases without in-depth knowledge of the algorithms associated with each test case syntax; using this condensed syntax, the test cases may be designed with a simple program that specifies the relationship between different syntax, the parameters of each test case and the test cases (CL3, L66 to CL4, L6). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the method of **HE** with the method of **EL** that included a definition of the DUT by converting the condensed syntax into an enumeration of possible parameter combinations for the DUT, as that would allow the test engineer to convert the test case definition file directly to test cases without in-depth knowledge of the algorithms associated with each test case syntax; using this condensed syntax, the test cases might be designed with a simple program that specified the relationship between different syntax, the parameters of each test case and the test cases.

10.2 As per Claim 7, **HE**, **GE** and **EL** teach the method of Claim 5. **HE** does not expressly teach that the syntax specifies a range of parameter values for the bus transactions. **GE** teaches that the syntax specifies a range of parameter values for the bus transactions (Fig. 3; CL5, L23-33; CL6, L65 to CL7, L36), as that allows generating a relatively large number of random test cases that are more likely to test specific behavior specified by the parameters in the configuration file (CL5, L23-33). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **HE** with the method of **GE** that included the syntax specifying a range of parameter values for the bus transactions, as that would allow generating a relatively large number of random test cases comprising bus transactions that

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would be more likely to test specific behavior of the bus transactions specified by the parameters in the configuration file.

11. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Hellestrand et al. (HE)** (U.S. Patent 6,263, 302) in view of **Geer et al. (GE)** (U.S. Patent 6,212,667) and **El-Ghoroury et al. (EL)** (U.S. Patent 5,867,400), and further in view of **Huggins (HU)** (U.S. Patent 5,956,478).

11.1 As per Claim 6, **HE**, **GE** and **EL** teach the method of claim 5. **HE** does not expressly teach rules in the configuration file to include or exclude parameter combinations from the enumeration. **HU** teaches rules in the configuration file to include or exclude parameter combinations from the enumeration (CL2, L35-39), as that allows generating the test cases in reduced time and produces tests which exercise the device in a manner which is close to actual operation, to increase their effectiveness in testing (CL2, L41-45). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **HE** with the method of **HU** that included rules in the configuration file to include or exclude parameter combinations from the enumeration, as that would allow generating the test cases in reduced time and would produce tests which exercised the device in a manner which was close to actual operation, to increase their effectiveness in testing.

12. Claims 8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hellestrand et al. (HE)** (U.S. Patent 6,263, 302) in view of **Geer et al. (GE)** (U.S. Patent

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6,212,667), **El-Ghoroury et al. (EL)** (U.S. Patent 5,867,400) and **Huggins (HU)** (U.S. Patent 5,956,478), and further in view of **Apostol, Jr. et al. (AP)** (U.S. Patent 6,247,084) and **Sheafor et al. (SH)** (U.S. Patent 6,321,285).

12.1 As per Claim 8, **HE**, **GE** and **EL** teach the method of claim 5. **HE** does not expressly teach that the syntax specifies transaction types. **AP** teaches that the syntax specifies transaction types (Fig. 10; CL10, L55-57), because as per **HU**, that allows producing tests which exercise the device in a manner which is close to actual operation, to increase their effectiveness in testing (CL2, L41-45). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **HE** with the method of **AP** that included the syntax specifying transaction types, as that would allow producing tests which exercised the device in a manner which was close to actual operation, to increase their effectiveness in testing.

HE does not expressly teach that the syntax specifies a set of parameters for each transaction type and directives for determining a mode of the converting. **SH** teaches that the syntax specifies a set of parameters for each transaction type and directives for determining a mode of the converting (Fig. 3; CL10, L44-50), as that allows appropriately configuring the bus transfer between the master and slave modules (Fig. 3, Item 166; CL10, L49-50). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **HE** with the method of **SH** that included the syntax specifying a set of parameters for each transaction type and directives for determining a mode of the converting, as that would allow appropriately configuring the bus transfer between the master and slave modules.

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12.2 As per Claim 11, **HE**, **GE**, **EL**, **HU**, **AP** and **SH** teach the method of claim 8. **HE** does not expressly teach that the directives cause the transaction types to be selected at random. **GE** teaches that the directives cause the transaction types to be selected at random (Fig. 3; CL5, L23-33; CL6, L65 to CL7, L6), as that allows generating random test cases that are more likely to test specific behavior specified by the parameters in the configuration file (CL5, L23-33). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **HE** with the method of **GE** that included the directives causing the transaction types to be selected at random, as that would allow generating random test cases comprising bus transactions that would be more likely to test specific behavior of the bus transactions specified by the parameters in the configuration file.

Allowable Subject Matter

13. Claims 9 and 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is

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703-305-0043. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on (703) 305-9704. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9600.

K. Thangavelu
Art Unit 2123
November 28, 2003


HUGH JONES PH.D.
PRIMARY PATENT EXAMINER
TECHNOLOGY CENTER 2100